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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/600,203

06/20/2003

Grant M. Kloster

42P17058

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01/23/2006

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EXAMINER

NGUYEN, KHIEM D

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 01/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/600,203	KLOSTER ET AL.	
	Examiner	Art Unit	
	Khiem D. Nguyen	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14, 16, 26, 27 and 29-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-14 and 16 is/are allowed.
- 6) ☒ Claim(s) 1-9, 26, 27 and 29-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>11/18/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

The non-final rejection as set forth in paper No. (072705) mailed on August 3rd, 2005 is withdrawn in response to Applicants' amendments. A new rejection is made as set forth in this Office Action. Claims (1-14, 16, 26, 27, and 29-41) are pending in the application.

Information Disclosure Statement

The Information Disclosure Statement filed on November 18th, 2005 has been considered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

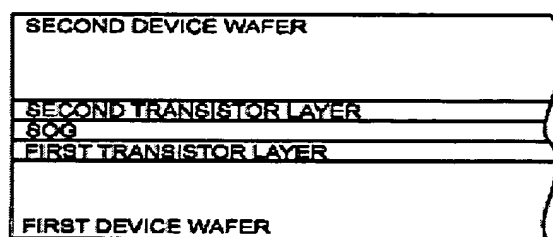
(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-8, 26, 27, 31-34, and 36-41 are rejected under 35 U.S.C. 102(e) as being anticipated by Allman (U.S. Patent 6,570,221).

In re claim 1, Allman discloses a method, comprising: forming a layer of first material **SOG** between two substrates (**first and second device wafers**) of a stacked device; and

forming a layer of second material between the two substrates (**first and second device wafers**) of the stacked device, wherein the second material causes a reaction (cross-linked) in a portion of the first material (col. 4, lines 36-52 and FIG. 8C).

FIG. 8C



In re claim 2, Allman discloses that the reaction comprises polymerization (col. 4, lines 36-52).

In re claim 3, Allman discloses that forming the layer of first material comprises diffusing the first material between a portion of the two substrate of the stacked device (col. 2, lines 33-38).

In re claim 4, Allman discloses that the first material must be selected from the group consisting of: diisocyanate monomers, a diisocyanate end-capped compliant oligomer, and p-toluenesulfonyl semicarbazide (col. 4, lines 36-52).

In re claim 5, Allman discloses that forming the layer of first material comprises one or more of: injecting the first material between a portion of the two substrates of the stacked device, spraying the first material between the portion of the two substrates of the stacked device, and immersing the two substrates of the stacked device in the first material (col. 2, lines 33-38).

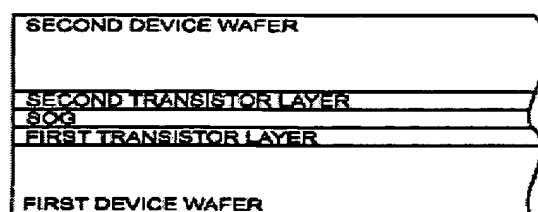
In re claim 6, Allman discloses that forming the layer of second material comprises diffusing the second material between a portion of the two substrates of the stacked device (col. 2, lines 39-48).

In re claim 7, Allman discloses that the second material is selected from the group consisting of: water, a hydroxyl end-capped oligomer, and a carboxylic acid end-capped polymer (col. 2, lines 39-48).

In re claim 8, Allman discloses that forming the layer of second comprises one or more of: injecting the second material between a portion of the two substrates of the stacked device, spraying the second material between the portion of the two substrates of the stacked device, and immersing the two substrates of the stacked device in the second material (col. 2, lines 3-38).

In re claim 26, Allman discloses a method of forming a stacked device filler, comprising: forming a layer of material **SOG** between two substrates (**first and second device wafers**) of a stacked device; and reacting a portion of the layer of material, wherein the reaction (cross-linked) results in the portion of the layer of material increasing in volume (col. 4, lines 36-52 and FIG. 8C).

FIG. 8C



In re claim 27, Allman discloses that the reaction comprises polymerization (col. 4, lines 36-52).

In re claim 31, Allman discloses that depositing the first material comprises one of: diffusing the first material into the portion of the area between the two substrates; injecting the first material into the portion of the area between the two substrates; spraying the first material into the portion of the area between the two substrates; or immersing the two substrates in the first material (col. 2, lines 33-38).

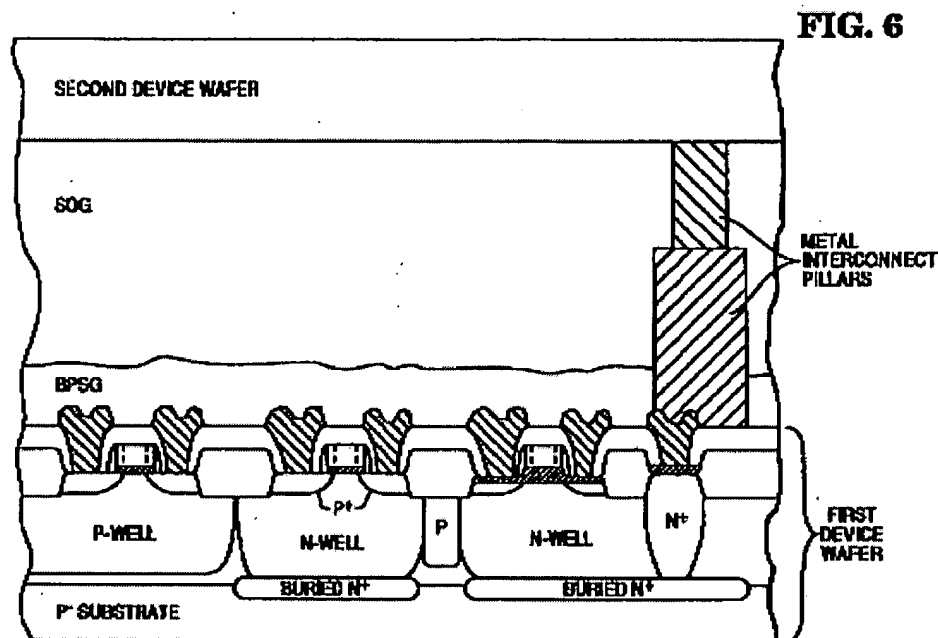
In re claim 32, Allman discloses that the first material is selected from the group consisting of: diisocyanate monomers, a diisocyanate end-capped compliant oligomer, and p-toluenesulfonyl semicarbazide (col. 4, lines 36-52).

In re claim 33, Allman discloses that depositing the second material comprises one of: diffusing the second material into the portion of the area between the two substrates; injecting the second material into the portion of the area between the two substrates; spraying the second material into the portion of the area between the two substrates; or immersing the two substrates in the second material (col. 2, lines 33-38).

In re claim 34, Allman discloses that the second material is selected from the group consisting of: water, a hydroxyl end-capped oligomer, and a carboxylic acid end-capped polymer (col. 3, lines 39-48).

In re claim 36, Allman discloses that the reaction in the layer of material comprises polymerization (col. 4, lines 36-52).

In re claim 37, Allman discloses that forming the layer of material comprises forming the layer of material to a thickness greater than the top surface of the interconnect structure (FIG. 6).



In re claim 38, Allman discloses that the layer material is selected from the group consisting of: water, a hydroxyl end-capped oligomer, and a carboxylic acid end-capped polymer.

In re claim 39, Allman discloses a method of forming stacked wafers comprising: providing a first wafer (**first device wafer**) having a first conductive interconnect (**bottom metal interconnect pillar**); providing a second wafer (**second device wafer**) having a second conductive interconnect structure (**upper metal interconnect pillar**); bonding the first conductive interconnect structure to the second conductive interconnect structure; and providing a foam (**SOG**) filling an area between the first and second wafers

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adjacent to the first and second conductive interconnect structures (col. 6, lines 19-52 and FIGS. 6 and 8C).

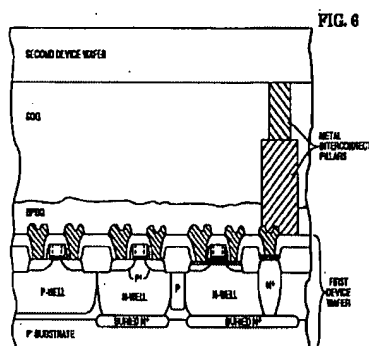
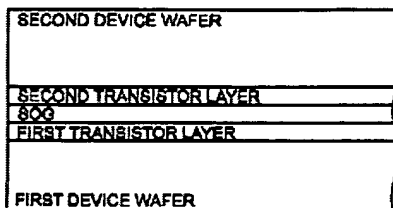


FIG. 8C



In re claim 40, Allman discloses that the method of claim 39, further comprising: thinning at least one of the first and second wafers, the foam providing structure support to the stacked wafers during the thinning (FIGS. 6 and 8C).

In re claim 41, Allman discloses that the method of claim 39, further comprising: protecting the first and second interconnect structures from oxidation using the foam during a subsequent wafer process (FIGS. 6 and 8C).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9, 29, 30, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Allman (U.S. Patent 6,570,221) in view of Poco et al. (U.S. Patent 6,168,737).

In re claim 30, Allman discloses a method comprising: depositing a first material SOG between two substrates (**first and second device wafers**) of a stacked device; and depositing a second material between the two substrates of the stacked device, wherein a reaction between the first material and the second material fills a portion of an area between the two substrates as a product of the reaction (col. 4, lines 36-52 and FIG. 8C).

In re claim 35, Allman discloses a method comprising: forming a layer of material SOG on a substrate (**first device wafer**) including an interconnect structure (**Metal interconnect pillar**) formed thereon; removing a portion of the layer of material to expose a top surface of the interconnect structure; combining the substrate (**first device wafer**) with another substrate (**second device wafer**); and filling an area between the two substrates as a product of a reaction in the layer of material (col. 4, lines 19-52).

In re claims 9, 29, 30, 35 Allman does not explicitly disclose that the reaction produces a polymer foam.

Poco, however, discloses that the reaction produces a polymer foam 24 (col. 3, lines 27-37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teaching of Allman and Poco to enable the process of producing a polymer foam as a product of the reaction of Allman to be performed and furthermore to fabricate patterned, gel-derived dielectric structures suitable for use in vacuum environments for electronic devices (col. 2, line 21-23, Poco).

Allowable Subject Matter

Claims 10-14, and 16 are allowed.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D. Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:30 AM - 5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K.N.

January 19, 2006



**W. DAVID COLEMAN
PRIMARY EXAMINER**